

2. The assignee is an individual rather than a company.¹

According to the Examiner, because the PCT application lists the international assignee, Mssrs. Olafsson and Kenney, as applicant, the signed statement of Mr. Olafsson in the declaration of the present U.S. application that he is the true inventor is presumptively false, making a rejection under 35 USC §102(f) (inventorship) appropriate. In reply, it is again respectfully submitted that there is NO logical relationship between the identity of the international assignee and the question of inventorship. In the absence of some evidence that an international co-assignee is an inventor, and there is no such evidence, a §102(f) rejection is completely and clearly improper. The fact of being a co-assignee is not evidence of inventorship.

This rejection constitutes a completely novel and unprecedented reversal of the usual examination procedure. The Examiner is in effect requiring that the Applicant prove inventorship, by means other than the usual declaration filed with the application, *based solely on the nature of the assignee listed as "applicant" on the PCT application*. The only possible response to such a novel rejection is to again state that (i) Mr. Olafsson is the true inventor, *as indicated in the signed declaration of the present application*; (ii) the listing of an assignee in a PCT application has nothing to do with inventorship; and (iii) the Applicant intends to take this issue up on appeal, but hopes that the Examiner can confer with someone having knowledge PCT procedures so that the expense of an appeal will not be necessary.

¹ The reason for listing basis "B" is that I assume that the Examiner would not have made the rejection if the assignee had been a company, i.e., if the PCT application had listed Company X as the Applicant rather than Olafsson and Kenney, then the Examiner would not have assumed that Company X was an inventor. Therefore, the rejection must have been triggered by the fact that the co-assignee, Mr. Kenney, is an individual rather than a company. There is certainly no explicit suggestion in the record that Mr. Kenney is an inventor.

The Examiner is invited to verify that it is common for PCT applications to list companies or individual assignees as Applicants. In fact, the Examiner is strongly urged to verify whether it is proper to make a §102(f) rejection solely on the basis that the PCT application lists two individuals (one of whom is the inventor) as applicant. This would mean that the Patent Office has been using the wrong procedure for all of the tens or hundreds of thousands of PCT applications, including hundreds from my office, that list individuals as co-applicants with the inventor.

Although the identity of the international ASSIGNEE bears NO logical relation to the question of INVENTORSHIP, the Inventor, Mr. Olafsson, does wish to note that he is a research scientist specializing in physics and materials science at a university in Iceland (a country in the middle of the North Atlantic), and that Mr. Kenney is a patent attorney with an office in Alexandria, VA, USA, who has never claimed to be an expert in physics or materials science, has no access to lab equipment, has never published a paper in anything other than patent law, and has never claimed to be an Inventor of the subject matter claimed in the application. The Examiner will note that Mr. Kenney's name is in fact listed on the declaration of the present U.S. application, but only in the "Power of Attorney" section.

Because this rejection is improper and has no basis in law, fact, or Patent Office procedure, withdrawal of the rejection is again respectfully requested.

2. Rejection of Claims 1-16 Under 35 USC §112, 1st Paragraph

This rejection is on the basis that those skilled in the art would not understand that those skilled in the art would not have understood that the appropriate units for "area" are μm^2 rather than μm unless the original description recited the shape of the area as a square, i.e., that only squares have "squared" units. As explained on page 3, lines 7-10 of the Official Action:

The original claim 1, mixed linear units with area which did not make sense logically or mathematically, so while some arguments might have been made (but weren't) about how μm^2 are the proper units for area, it does not necessarily follow that the area is the square of the linear dimension, because no shape was defined. The Examiner found no teachings requiring that surface area treated be square in shape, which would support the amendment.

In reply, the U.S. Applicant, i.e., the Inventor (hereinafter referred-to as "the Applicant"), wishes to note that the undersigned did not argue in the last response that μm^2 are proper units for area because it was assumed that this was understood. Since it was not, the Applicant hereby argues that μm^2 are proper units for area. Furthermore, the Applicant respectfully submits that μm^2 are proper units for all areas, and not just squares. The

“square” in “square meters” refers to the fact that the units are units of area, and not to the shape of the area.

Nevertheless, claim 1 has been amended to return to the original wording of non-squared units. In particular, claim 1 has been amended to refer to linear dimensions of the area of material affected, thereby eliminating the “new matter” of areas having squared dimensions, and clearly overcoming the “new matter” rejection.

Because the amendment merely returns the claim to its original wording, without changing its scope relative to the prior art, it is respectfully submitted that the amendment does not raise new issues or introduce new matter, and entry of the amendment is respectfully requested.

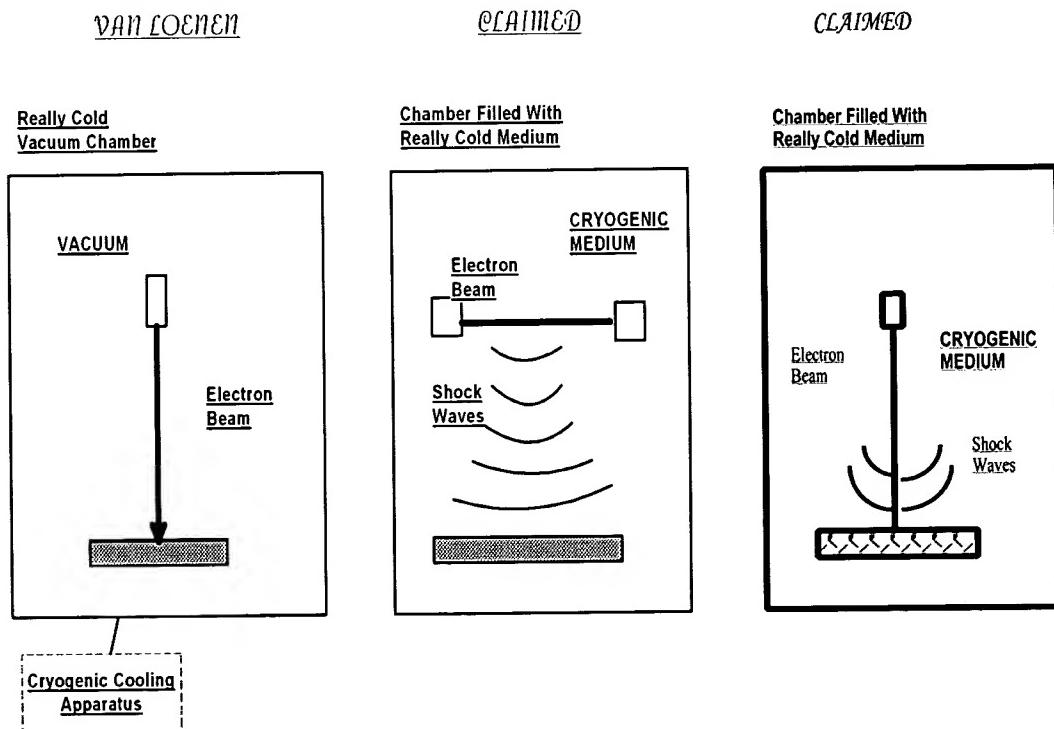
3. Rejections of Claims 1-3, 6, and 12 Under 35 USC §102(b) in view of U.S. Patent No. 5,038,322 (Van Loenen), and of Claims 5, 9-11, and 14-16 Under 35 USC §103(a) in view of the Van Loenen patent

This rejection is again respectfully traversed on the grounds that the Van Loenen patent fails to disclose or suggest processing a material by a controlled succession of nanometer scale thermal spikes of varying energy in a cryogenic medium, as recited in claim 1 (although the apparatus of Van Loenen may optionally be cryogenically cooled, as discussed below). Instead, in Van Loenen, a feedback controlled constant tunneling current is used to dig a pit and then the tip is lowered into the material to be processed. At the time that energy in the form of the electron beam is being transferred, the tunneling current serves as an input to a distance servo, and therefore can only vary with distance. When the voltage is varied, the purpose is essentially to guide the tip into the pit dug by the tunneling current.

As pointed-out in the prior response, the Van Loenen patent discloses cryogenic cooling, but merely discloses that the **VACUUM CHAMBER** in which the process is performed may, optionally, be maintained at a low temperature by means of a “cryogenic cooler,” as described in col. 6, lines 28-35. This is not the same as, or suggestive of, use of

a cryogenic medium, as claimed. Instead, the cooling of Van Loenen is to facilitate operation of the scanning electron microscope, and not for reasons related specifically to the etching process with which the Van Loenen patent is concerned. There is no disclosure in Van Loenen of a cryogenic medium, much less the controlled propagation of thermal spikes or shockwaves through the medium in the manner claimed.

According to the Examiner, the difference between performing etching in a cryogenically cooled apparatus and performing etching by sending shockwaves through a cryogenic medium is merely one of **semantics**. The Applicant most strongly disagrees. A **VACUUM** is NOT a **MEDIUM**, and emission of shockwaves in a cryogenic medium is not the same as use of an electron beam in a vacuum chamber that is cryogenically cooled. **Shockwaves can ONLY be generated in the presence of a “medium.” Shockwaves cannot be generated in a vacuum.** THIS IS NOT A MATTER OF SEMANTICS, as can be seen in the following illustration (which compares Van Loenen's vacuum chamber with the two principal embodiments of the claimed cryogenic medium shockwave chamber):



The claims of the present application specifically recite use of an electrode to emit electrons and thereby cause propagation of shock waves in a cryogenic medium. The etching of Van Loenen is said to be carried out in a vacuum chamber, which by definition is devoid of any "medium." Rather than teaching generation of nanometer-scale shockwaves, Van Loenen teaches AWAY from shockwaves in a medium since those skilled in the art will appreciate that the purpose of using a vacuum is in effect to prevent transfer of energy from the beam to the medium (and therefore the formation of shock waves).

The fact that the vacuum chamber of Van Loenen is cooled to cryogenic temperatures in no way implies that Van Loenen generates shockwaves in a cryogenic medium as claimed. Since the Van Loenen patent does not suggest the claimed propagation of thermal spikes or shockwaves in a medium, and certainly does not suggest propagation in a cryogenic medium for the purpose of efficiently transferring energy to a nano-scale area of the workpiece so as to facilitate the occurrence of chemical processes in the local area, withdrawal of the rejections of claims 1-6, 9, and 12 based on the Van Loenen patent is respectfully requested.

4. Rejection of Claim 13 Under 35 USC §103(a) in view of U.S. Patent Nos. 5,043,578 (Van Loenen) and 5,352,330 (Wallace)

This rejection is again respectfully traversed on the grounds that the Wallace patent, like the Van Loenen patent, fails to disclose or suggest processing a material by generating a controlled succession of nanometer scale thermal spikes of varying energy, much less processing the material by thermal spikes of varying energy that propagate in a cryogenic medium, as recited in claim 1, from which claim 13 depends.

Instead, the Wallace patent discloses use of a low energy electron beam (as opposed to a conventional light beam) to remove surface passivation through an electron stimulated desorption effect. This effect requires that the electrons interact with atomic bonds between hydrogen and silicon to repel silicon atoms from the surface of the material. Thermal spikes or shockwaves are not utilized (assuming that "low energy" electrons would even generate

such shockwaves), and no attempt is made to vary the energy of the thermal spikes or shockwaves. The process does not use a medium during the desorption, although oxygen is added later, and there is no suggestion of carrying out the process at cryogenic temperatures.

It is respectfully submitted that since carrying out a process at cryogenic temperatures is more difficult than carrying out a process at room temperature, one of ordinary skill in the art would not have done so in the absence of a teaching that the specific process in question would benefit from being carried out in the presence of a cryogenic medium. Accordingly, it is respectfully submitted that the Van Loenen and Wallace patents could not have suggested the claimed invention, whether considered individually or in any reasonable combination, and withdrawal of the rejection of claim 13 under 35 USC §103(a) is respectfully requested.

5. Rejection of Claims 7, 9-11, and 14-16 Under 35 USC §103(a) in view of U.S. Patent Nos. 5,043,578 (Van Loenen), 3,720,598 (Thompson), and 4,343,993 (Binnig)

This rejection is again respectfully traversed on the grounds that while the Thompson patent teaches the use of cryogenic fluids as a medium through which an arc is discharged in a "cryogenic arc furnace," as discussed on pages 3-4 of the present application, there is no suggestion of using such a cryogenic medium in an electron beam etching system of the type disclosed by Van Loenen. The fact that cryogenic media are required in cryogenic blast furnaces is not a teaching that such media would be used in other, non-arc based media processing apparatus. To the contrary, in the absence of a teaching that the electron beam of Van Loenen could be used to propagate thermal spikes or shockwaves in the cryogenic medium (and there is absolutely no use for such spikes or shockwaves in the system of Van Loenen), it cannot be said that the ordinary artisan would have been motivated by Thompson to modify the system of Van Loenen to generate such shockwaves, much less in a controlled succession of thermal spikes or shockwaves of varying energy, as claimed.

The teachings of Binnig, on the other hand, are directly applicable to the system of Van Loenen. In particular, Binnig teaches vacuum operation and cryogenic cooling of a scanning tunneling microscope to improve to suppress thermal fluctuations and thereby improve the sensitivity of the microscope. However, this merely explains why Van Loenen mentions cryogenic cooling, and is not suggestive of a cryogenic shockwave-propagation medium, as claimed.

The cryogenic cooling of a scanning tunneling microscope, as disclosed by Van Loenen and Binnig, has absolutely nothing to do with the cryogenic medium of the present invention. Van Loenen and Binnig are seeking to minimize disturbances in the scanning electron beam and circuitry by operating the apparatus at cryogenic temperatures in a vacuum, so that the electron beam does not have to pass through any medium. As a result, adding a medium of any kind would be contrary to the principles of operation of the Van Loenen and Binnig devices, while causing thermal spikes or shockwaves of varying energy would only make the situation worse, rendering it impossible to achieve the desired angstrom scale scanning resolution.

The Examiner is reminded a combination is improper if the teachings of the secondary reference appear to negatively affect the operation of the device disclosed in the primary reference. As explained in MPEP 2143.02 (page 2100-111):

If the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification (citing *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)).

It is respectfully submitted that the addition of a medium to a system, such as that of Van Loenen or Binnig, that requires a vacuum is exactly the type of "unsatisfactory" modification referred-to in MPEP 2143.02.

In fact, even if just a *change* in principles of operation is required, the combination is non-obvious unless the teachings specifically address the changing in operating principle. For example, as explained in MPEP 2143.02:

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If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious (citing *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959)...*The court reversed the rejection holding the "suggested combination of references would require a substantial reconstruction and redesign of the elements shown in [the primary reference] as well as a change in the basic principle under which the [primary reference] construction was designed to operate"* 123 USPQ at 352. (See also, MPEP 2141.02, p. 2100-107 "**A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention** (emphasis in the original).

It is respectfully submitted that the proposed modifications of the Van Loenen system would certainly change its principle of operation in ways that are not justified by the teachings of Binnig or Thompson.

Because Thompson discloses non-nano-scale cryogenic blast furnace as discussed on pages 2 and 3 of the present application, and Van Loenen considered in view of Binnig effectively teaches away from a cryogenic medium by requiring not only cryogenic cooling, but also a vacuum, it is respectfully submitted that rejection of claim 7 under 35 USC §103 is improper and should be withdrawn.

Having thus overcome each of the rejections made in the Official Action, withdrawal of the rejections and expedited passage of the application to issue is requested.

Respectfully submitted,

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